

REMARKS

I. Status of the Application

Claims 1-82 are all the claims pending in the Application. Claims 3, 13-29, 32 and 42-82 are withdrawn from consideration. Claims 1-2, 4-12, 30-31 and 33-41 have been rejected.

II. Formalities

As noted in the previous Response filed on March 12, 2009 (hereinafter “the previous Response”), with the Office Action mailed November 6, 2008, the Examiner returned the PTO/SB/08 filed with the Information Disclosure Statement June 25, 2008, indicating that all the references cited therein had been considered. Thereafter, the Examiner returned a copy of the same PTO/SB/08 with the Office Action dated December 18, 2008 in which all of the cited references had been crossed-out.

Applicant again requests that the Examiner confirm on the official record that the references cited with the Information Disclosure Statement June 25, 2008 have been considered, or properly indicate why the aforementioned references have not been considered.

III. Claim Rejections Under 35 U.S.C. § 112

Claims 1, 22, 30 (and all depending claims) are rejected under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Applicant respectfully traverses all of the rejections for *at least* the reasons set forth below.

As an initial matter, as noted in the previous Response, claim 22, and all claims depending from claim 22, have been withdrawn.

The Examiner was not persuaded by arguments advanced with the previous Response and maintains his rejections under 35 U.S.C. § 112, requesting Applicant to provide a “thorough and detail explanation of exactly what defines the claimed ‘spectral shaper’” (06/08/09 Office Action, page 7). Applicant respectfully submits that the requested detailed explanation of exactly what defines the claimed spectral shaper would have been clear to one of ordinary skill in the art in light of the specification. Nevertheless, Applicant provides additional clarification below, for the convenience of the Examiner, and submits that claims 1, 30 (and all depending claims) plainly satisfy the requirements of 35 U.S.C. § 112 since all of these claims define the claimed invention with a reasonable degree of particularity and distinctness when these claims are construed according to correct principles in light of the specification¹.

Indeed, MPEP § 2173.02 stipulates that the essential inquiry under 35 U.S.C. § 112, second paragraph, is whether the claims set out and circumscribe a particular subject matter with a reasonable degree of clarity and particularity. Further, the Examiner is required to analyze the definiteness of the claim language, not in a vacuum, but in light of: (A) the content of the particular application disclosure; (B) the teachings of the prior art; and (C) the claim interpretation that would be given by one possessing the ordinary level of skill in the pertinent art at the time the invention was made. Here, the outstanding Office Action analyzes the claims in a vacuum, and fails to specifically analyze the claim language in light of the specification, the teachings of the prior art, or the interpretation given by those of ordinary skill in the art.

¹ See e.g., MPEP §2111.01

First, for example, Applicant respectfully notes that the previous Response is replete with citations to numerous aspects of the specification which demonstrate that the pending claims, when properly construed in light of the specification, define the claimed invention with a reasonable degree of particularity and distinctness. However, contrary to the requirements of MPEP §707.07(f)², the Examiner's "Response to Arguments" fails to address any of the previously identified citations to the specification, and fails to articulate any reasoning whatsoever as to why one of ordinary skill in the art, when properly construing the claims in light of the aforementioned citations, would nevertheless still fail to understand the scope of the claims. Applicant respectfully maintains that the clarification requested by the Examiner would have been evident to one of ordinary skill in the art upon a careful reading of the claims in light of the specification.

Second, in response to Applicant's previous arguments, the Examiner alleges that "Applicant states that the claims (1, 22 and 30) do not recite a spectral shaper, when they clearly do." Applicant respectfully disagrees with the Examiner's allegations and draws the Examiner's attention to page 4 of the previous Response, which states "Applicant notes that that none of the pending claims 1, 22 and 30 recite the feature of 'a spectral shaper stage,' as alleged" (emphasis added). The pending claims clearly do not recite the feature of a spectral shaper stage, as alleged. Thus, Applicant reiterates that the current rejections are improper *at least* because they

² MPEP § 707.07(f) explicitly requires that the Examiner answer all material that has been traversed by the Applicant. MPEP §707.07(f) also requires that "[w]here the applicant traverses any rejection, the examiner should, if he or she repeats the rejection, take note of the applicant's argument and answer the substance of it" (emphasis added).

are based on the Examiner's inaccurate paraphrasing of the claimed invention rather than the recitations of the claims themselves.

Third, in response to Applicant's previous arguments, the Examiner alleges that "[a]s per applicant's arguments that the claims do not recite an 'echo estimate', the examiner notes that applicant's claims clearly recite an 'estimated acoustic echo component', as well as an echo replica." Applicant respectfully notes that the Examiner's allegations effectively acknowledge the persuasiveness of Applicant's previous arguments that the claims do not recite the feature of "the echo estimate" and further demonstrate that the rejections are improper *at least* because they are based on the Examiner's inaccurate paraphrasing of the claimed invention rather than the recitations of the claims themselves.

Fourth, in response to Applicant's previous arguments, the Examiner maintains that it is not clear what this "estimated echo component" comprises or how it is any different than what is estimated by the traditional echo canceller stage." In particular, the Examiner alleges that it is not clear exactly what applicant's claimed spectral shaper is doing since "[o]ne of skill in the art would realize that the echo replica produced by the echo canceller is an echo estimate" and "[i]t is not clear how this echo estimate (echo replica) would further be modified to produce an echo estimate (estimated echo component)."

Applicant respectfully disagrees and submits that, when the claims are properly construed in light of the specification, it would be abundantly clear to one of ordinary skill in the art how said acoustic echo component is estimated by modifying said echo replica (*see e.g.*, Specification, page 5, line 30 - page 12, line 17). For example, as explained in the present

specification regarding an illustrative embodiment, the linear echo canceller 3 uses a replica of the transfer function of the acoustic echo path to produce an echo replica (page 1, lines 22-24). That is, the echo replica produced by the linear echo canceller 3 is based on linear echo estimation. However, one of ordinary skill would understand that, in practical systems such as cellular phone or notebook computers, the nonlinear characteristics are of such a magnitude that the linear echo canceller 3 cannot completely replicate the transfer function of a nonlinear acoustic echo path (Specification, page 2, lines 1-25).

In light of the discussion provided in the specification, one of ordinary skill in the art would understand that illustrative embodiments of the claimed invention modify the echo replica produced by the linear echo canceller 3 (which is based on linear echo estimation) to estimate an acoustic echo component which more effectively compensates for nonlinear distortion of the echo channel in the acoustic path (Specification, page 9, lines 15-21).

Without conceding to the merits of the Examiner's rejections, claim 1 has been amended, as set forth above, to more clearly specify the features of an echo canceller having a replica of a transfer function of said acoustic echo path for producing an echo replica from both of said distant signal and from a residual echo representing a difference between said near-end signal and said echo replica. Claim 30 has also been amended to more clearly specify the features of producing an echo replica from both of said distant signal and from a residual echo representing a difference between said near-end signal and said echo replica by using a replica of a transfer function of said acoustic echo path and by using the residual echo as a feedback signal to produce said echo replica.

Additionally, the specification is replete with clear examples illustrating precisely how the echo replica produced by the linear echo canceller 3 can be further modified to estimate the acoustic echo component. For instance, according to one illustrative embodiment, the spectral shaper is configured as a spectral subtractor 10, which divides the second input signal (e.g., the echo replica received from the linear echo canceller 3) into a second set of subband frequency components (Specification, page 5, line 30 - page 6, line 4). Then, from this second set of subband frequency components, and a first set of subband frequency components obtained from the first input signal, nonlinear subband echo components are estimated to produce a set of echo cancellation signals respectively corresponding to the subband frequencies (Specification, page 6, lines 4-7). Finally, nonlinear echo components respectively contained in the first set of subband frequency components are cancelled by the corresponding subband echo cancellation signals and then combined together into a local signal for transmission (Specification, page 6, lines 7-10).

In view of such examples, one of ordinary skill in the art would readily understand that the recited echo replica (which is based on linear echo estimation) can be further modified to estimate the acoustic echo component (which incorporates nonlinear echo estimation) by, for instance, performing nonlinear calculations in the frequency domain and compensating for nonlinear distortion of the echo channel in the acoustic path (page 6, lines 5-10; page 9, lines 15-21). In particular, according to one illustrative embodiment, the claimed spectral shaper can employ Fourier transform converters 11 and 12, which perform M-point Fourier transform

calculations on its input from the echo canceller 3 to compensate for nonlinear distortion (page 6, line 11 – page 9, line 14 and FIG. 3).

Other examples demonstrating that it would have been clear to those of ordinary skill in the art as to how the echo replica produced by the linear echo canceller 3 can be further modified to estimate the acoustic echo component, are provided by the specification page 12, line 18 - page 16, line 12, which describes that the spectral shaper may employ Fourier coefficient multipliers 53-1 ~ 53-m rather than the Fourier coefficient subtractors 13-1 ~ 13-m of Fig. 3 so as to remove a residual echo resulting from the echo canceller 3 making a false echo path estimation.

For *at least* the reasons above, it would have been clear to those of ordinary skill in the art, in light of the specification, as to how the claimed echo replica can be further modified to estimate the acoustic echo component. Accordingly, the pending claims define the claimed invention with a reasonable degree of particularity and distinctness when these claims are properly construed in light of the specification and, thus, the claims plainly satisfy the requirements of 35 U.S.C. § 112.

Fifth, in response to Applicant's previous arguments, the Examiner alleges that "it is not clear how the claimed device would function when the spectral shaper stage receives the input directly from the microphone (near-end signal)." Applicant respectfully disagrees and submits that it would have been clear to one of ordinary skill in the art how the claimed device would function when the spectral shaper stage receives the input directly from the near-end signal *at least* in view of page 5, line 24 - page 6, line 10 of the present specification, which explicitly

describes how an illustrative embodiment functions if the output of the microphone 1 is used as an input to the spectral shaper 10.

For *at least* the reasons above, it would have been clear to those of ordinary skill in the art, in light of the specification, as to how the claimed device would function when the spectral shaper stage receives the input directly from the near-end signal. Accordingly, the pending claims define the claimed invention with a reasonable degree of particularity and distinctness when these claims are properly construed in light of the specification and, thus, the claims plainly satisfy the requirements of 35 U.S.C. § 112.

Sixth, the Examiner alleges that “Applicant still has not disclosed exactly how the spectral shaper functions to determine a non-linear echo component based off the residual echo and the echo replica.” Applicant respectfully disagrees and submits that the present specification clearly discloses how the spectral shaper functions for *at least* the reasons already explained in detail above. Additionally, Applicant draws the Examiner’s attention to page 5, line 12 - page 6, line 10, which discloses how the spectral shaper 10 uses the output of subtractor 4 as its first input signal and a second input signal from linear echo canceller 3, divides each signal into first and second sets of subband frequency components, estimates nonlinear subband echo components to produce a set of echo cancellation signals respectively corresponding to the subband frequencies, cancels the nonlinear echo components, and then produces a local signal for transmission. Further, the exact functions performed by an illustrative spectral shaper are described in great quantitative detail by the present specification on page 6, line 11 - page 12, line 17.

For *at least* the reasons above, it would have been clear to those of ordinary skill in the art, in light of the specification, as to how the spectral shaper functions. Accordingly, the pending claims define the claimed invention with a reasonable degree of particularity and distinctness when these claims are properly construed in light of the specification and, thus, the claims plainly satisfy the requirements of 35 U.S.C. § 112.

Seventh, the Examiner alleges that “[i]t is not clear how the spectral shaper will function to perform this action [i.e., correcting the residual echo if the linear echo canceller makes an error] when it’s functions and inputs comprise the echo replica, which is directly dependent upon the linear echo canceller performing correctly.” Applicant respectfully disagrees and submits that the present specification clearly explains to those of ordinary skill in the art that even if the linear echo canceller 3 makes an error in the echo path estimation, resulting in a residual echo at the output of subtractor 4, the spectral subtractor of this invention can remove such a residual echo (Specification, page 11, lines 9-14). Moreover, the present specification explains with reference to an illustrative embodiment that, whereas the spectral shaper performs nonlinear calculations in the frequency domain and that nonlinear distortion of the echo channel in the acoustic path is effectively compensated for by adaptively adjusting the timings of the subband signals, in the time domain, the linear echo canceller 3 performs this operation in a manner complementarily to the operation of spectral subtractor 10 (Specification, page 9, lines 15-21).

For *at least* the reasons above, it would have been clear to those of ordinary skill in the art, in light of the specification, as to how the spectral shaper functions to correct the residual echo if the linear echo makes an error in the echo path estimation. Accordingly, the pending

claims define the claimed invention with a reasonable degree of particularity and distinctness when these claims are properly construed in light of the specification and, thus, the claims plainly satisfy the requirements of 35 U.S.C. § 112.

Finally, the Examiner summarily alleges that “Applicant is not using the term spectral shaper in a well known manner.” Applicant respectfully disagrees and points out that the Examiner has not provided any evidentiary support whatsoever to support the allegation that Applicant is not using the term spectral shaper in a well known manner.

Therefore, since claim 1 defines the patentable subject matter with a reasonable degree of particularity and distinctness, the Examiner should allow claim 1 for *at least* these reasons. Further, Applicant submits that the dependent claims 2 and 4-12 are allowable *at least* by virtue of their dependency on claim 1.

Further, in view of the similarity between the recitations of claim 1 and the recitations of claim 30, arguments analogous to the foregoing arguments as to the patentability of independent claim 1 demonstrate the patentability of claim 30. As such, claim 30 satisfies the requirements of 35 U.S.C. § 112 *at least* for reasons analogous to those presented above.

Additionally, with respect to claim 30, the Examiner was not persuaded by Applicant’s previous arguments that (1) there is no requirement in 35 U.S.C. § 112, second paragraph, stating that claim 30 must explicitly recite where the receiving operation is being performed in the claimed device, (2) since the meaning of claim 30 would have been readily discernable to one of ordinary skill in the art when construed according to correct principles, claim 30 satisfies the requirements of 35 U.S.C. § 112, and (3) when claim 30 is properly construed in light of the

specification, one of ordinary skill in the art would readily discern that, according to one illustrative embodiment, the receiving operation of claim 30 can be performed by the spectral shaper. However, contrary to the requirements of MPEP §707.07(f), the Examiner fails to provide any substantive response to each of these arguments. Quite to the contrary, the Examiner summarily states that “the examiner disagrees and maintains that it is not clear where the claimed signals are received from and what they are received by,” without providing any substantive response whatsoever to Applicant’s previous arguments.

Therefore, Applicant’s previous arguments remain unrebutted and claim 30 satisfies the requirements of 35 U.S.C. §112 for *at least* these reasons. Moreover, the dependent claims 31 and 33-41 are allowable *at least* by virtue of their dependency on claim 30.

Thus, the allowance of these claims is respectfully solicited of the Examiner.

IV. Claim Rejections Under 35 U.S.C. § 103

The Examiner has maintained his rejections of claims 1-2, 5, 30-31 and 34 under 35 U.S.C. § 103(a) as allegedly being unpatentable over U.S. Patent No. 6,510,224 to Christensson et al. (hereinafter “Christensson”). Claims 5 and 34 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Christensson and further in view of newly cited U.S. Patent No. 5,937,060 to Oh (hereinafter “Oh”). Applicant respectfully traverses these rejections for *at least* the reasons set forth below.

Contrary to the requirements of MPEP §707.07(f), the Examiner again fails to provide any substantive response to Applicant’s previous arguments. Specifically, in both the previous Response, and the Response filed on June 30, 2008, Applicant argued that Christensson fails to

teach or suggest that the near-end enhancement spectrum generator 309 therein receives the error signal $e(n)$ (i.e., the alleged residual echo) as a second input signal and estimates an acoustic echo component by modifying the received error signal $e(n)$, as required by claim 1.

Additionally, Applicant previously argued that Christensson also fails to teach or suggest that the near-end enhancement spectrum generator 309 receives one of the near-end signal and estimated echo signal $y(n)$ (i.e., the alleged echo replica) as a first input signal and, then, shapes a spectrum of one of said near-end signal and estimated echo signal $y(n)$ with the estimated acoustic echo component, which was estimated by modifying the received error signal $e(n)$, as further required by claim 1.

The Examiner has yet to provide any substantive response to either of the above arguments. To the contrary, the Examiner merely notes the rejections under 35 U.S.C. §112 discussed above and summarily concludes that “[t]he examiner is giving a reasonably broad reading to the term ‘spectral shaper’ and the echo estimate,” without substantively rebutting Applicant’s previous arguments by demonstrating how Christensson’s near-end enhancement spectrum generator 309 receives the error signal $e(n)$ (i.e., the alleged residual echo) as a second input signal and estimates an acoustic echo component by modifying the received error signal $e(n)$, or by demonstrating that Christensson’s near-end enhancement spectrum generator 309 receives one of the near-end signal and estimated echo signal $y(n)$ (i.e., the alleged echo replica) as a first input signal and, then, shapes a spectrum of one of said near-end signal and estimated echo signal $y(n)$ with the estimated acoustic echo component, which was estimated by modifying the received error signal $e(n)$.

Therefore, Applicant's previous arguments remain unrebutted and the pending claims are allowable for *at least* the reasons already of record.

V. Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

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